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FISIOLOGIA INTEGRATIVA E MECCANISMI DI CONTROLLO (SCIENZA DI BASE)

### HIGHER RESTING HEART RATE RELATES TO GREATER RISE IN PULMONARY VEIN PRESSURE UNDER EXERCISE DURING PERMANENT ATRIAL FIBRILLATION: A COMPUTATIONAL STUDY

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**Background:** Clinical data indicating a heart rate (HR) target during rate control therapy for permanent atrial fibrillation (AF) and regarding its eventual relationship with reduced exercise tolerance are lacking.

**Objective:** The present study aims at investigating the impact of resting HR on cardiovascular response to exercise in permanent AF patients by a computational cardiovascular model.

**Methods:** The AF lumped-parameter model was run to simulate resting (1 Metabolic Equivalent of Task - MET) and various exercise conditions (4 METs: brisk walking; 6 METs: skiing; 8 METs: running) starting from different resting HR (70 bpm for the slower resting HR - SHR - simulations, and 100 bpm for the higher resting HR - HHR - simulations). To allow comparison of relative variations of cardiovascular variables upon exertion, the variation comparative index (VCI) - the absolute variation between the exercise and the resting values in SHR simulations referred to the absolute variation in HHR simulations - was calculated at each exercise grade ( $VCI_4$ ,  $VCI_6$  and  $VCI_8$ ).

**Results:** Pulmonary vein pressure ( $VCI_4 = 0.71$ ,  $VCI_6 = 0.73$  and  $VCI_8 = 0.77$ ) underwent a greater increase, while systemic arterial pressure variations ( $VCI_4 = 1.15$ ,  $VCI_6 = 1.36$ ,  $VCI_8 = 1.56$ ) experienced a less sustained increase than expected in HHR compared to SHR simulations.

**Conclusions:** In terms of exercise tolerance, a slower resting HR could be preferable in permanent AF patients, since pulmonary vein pressure undergoes a slighter increase and systemic blood pressure a more appropriate increase with respect to a higher resting HR.

